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GROWTH CYCLES IN POLAND

1. Introduction

This paper refers to a broader research on composite indicators of economic activity for Poland, which was started in 1994 and has been continued in the Research Institute of Economic Development (RIED) at Warsaw School of Economics under five successive research projects headed by the author. The aim is to develop a system of composite indicators based on quantitative and qualitative data to be used in analysing cyclical changes in the economy as well as in forecasting. Three types of composite indicators have been developed to this purpose:

(a) general coincident indicator (GCI) – a monthly proxy to GDP, covering five major sectors of the economy: industry, construction, agriculture, and trade;
(b) composite leading indicators (CLI) based on quantitative and qualitative data, compiled according to OECD standards;
(c) economic sentiment indicators (ESI) vs. economic climate indicators (ECI) based on survey data.

The results have been published in RIED's 'Papers and Proceedings' (Matkowski, ed., 1997, 1998, 1999) as well as in economic journals. They have been also presented at several international conferences (e.g. CIRET Conferences in Budapest, Munich, Helsinki, Wellington and Taipei, and International Meetings on Economic Cycles in Ourense and Madrid). The new results are included in this book.

This paper introduces the concept of our aggregate indicator of economic activity, reflecting the development of output and sales in major sectors of the economy, which is then used to analyse economic cycles in Poland and serves as a reference indicator for composite leading indexes. The main results of our earlier research on the subject have been published in domestic and international sources (Matkowski 1995, 1996abc, 1997bcd, 1998, 1999ab, 2000, 2001).

The paper is composed of seven parts. Section 1 is this introduction. Section 2 tries to explain our interest in growth cycles. Section 3 introduces the concept of our reference indicator GCI. Section 4 clarifies the concept of growth cycle used in this analysis and specifies the procedures used to determine growth cycles. Section 5 presents the results of the analysis of our reference index including turning points and amplitudes of cycles. Section 6 analyses cyclical changes in major sectors of the economy against our reference index reflecting cyclical movement in the economy as a whole. Section 7 brings some conclusions.

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2. Background

As early as in the 70's and 80's it became clear (even from the official national income data) that Poland's economy, under the then prevailing property structure and management system, did not develop steadily. On the contrary, its growth record revealed fluctuations quite similar, at least in symptoms, to those observed in the developed market economies, elsewhere known as business vs. growth cycles. Attempts to interpret the facts indicated internal and external factors of instability seen in the centrally planned economy. Growth fluctuations were mainly attributed to the investment cycle and to the five-year period of medium term planning. Some authors also pointed to various institutional and behavioural sources of the changing rate of development as well as to exogenous factors such as business cycles in export markets and the fluctuation in agriculture caused by weather conditions (e.g. Kołodko, 1979; Eysymontt and Maciejewski, 1983; Lippe *et al.*, 1984). At about the same time or even earlier there also appeared several comparative studies on growth cycles in socialist economies, their causes and patterns (see: Olivera, 1960; Čobeljić and Stojanović, 1963; Stadler, 1964; Goldman, 1964; Bajt, 1971; Brainard, 1974; Bauer, 1978; Kýn *et. al.*, 1979; Sabov, 1983; Paraskewopoulos, 1985; Woźniak, 1985).

The deep fall in the Polish economy in 1989-91 combined the features of a typical recession with those of a structural crisis, augmented by the transformation of economic system, reorientation of foreign trade and radical anti-inflationary measures adopted in monetary and fiscal policy. Since 1992, Poland's economy showed a sustained and relatively rapid growth until 2000. The recent slowdown warns that the economy would not escape from cyclical fluctuations. On the contrary, with the progress of transformation towards an open market system, the Polish economy will probably become more apt for fluctuations typical of a market economy. This would increase the demand, by government and business, for a systematic appraisal of economic activity.

Most empirical analyses of growth cycles in the Polish economy hitherto relied on yearly national account data. Such attempts, irrespectively of all other merits, do not provide a sufficient framework for business cycle research. What we need in business cycle analysis are monthly or quarterly data. Wherever such data are missing, we should try to fill the gap by proper estimates. This is the approach taken in our research.

In earlier studies based on monthly or quarterly data (Kudrycka and Nilsson, 1993, 1995, 1996) business cycles in Poland were reconstructed on the basis of industrial production index or a combined index of industrial production and construction. The same indicator served as a reference series for the selection of leading indicators and for evaluation of their performance. In our research on growth cycles in Poland we employ a broader concept of the general indicator of economic activity, based on monthly output or sales data of five major sectors, including industry, construction, agriculture, transport and retail trade. We believe that such an indicator, even if still imperfect, gives a good approximation of the cyclical changes in gross domestic

product. The same indicator is used as a reference series in our work on composite leading indicators.

This analysis aims at the identification and measurement of growth cycles seen in the development of Polish economy over the last 30 years. The explanation of the mechanisms of those cycles would require a separate analysis. Most probably, it is not possible to construct a uniform theory which could explain growth cycles in different times and under different economic systems, including the transition from centrally planned to an open market economy.

There were many attempts to explain the transformation crisis in post-socialist transition countries (e.g. Gomułka, 1991; Kornai, 1994). There are also some attempts to explain the fluctuations observed during the transition period (e.g. Barczyk, 1997a; Barczyk and Kruszka, 2003), mostly on descriptive basis. However, there is no consistent model which could explain the special features of economic cycles in the period of transition.

3. Reference indicator

In order to reconstruct cyclical changes in the Polish economy over time in the absence of a regular GDP quarterly statistics, we have developed a synthetic composite indicator GCI (general coincident index) based on the available monthly data on output and sales. It is a weighted average of indices showing the output volumes in five major sectors of economy: industry, construction, agriculture, transport and trade.

The weights used are the average yearly shares of the sectors in GDP. The weights are changed each year, according to the changing structure of the economy. The index is calculated according to the formula:

$$\mathrm{GCI} = \frac{a_1 X_1 + a_2 X_2 + \ldots + a_5 X_5}{a_1 + a_2 + \ldots + a_5}$$

where X denotes the component index values, and a is the weight.

For industry and construction, activity levels are represented by the production volumes (production sold). For transport, we took the physical volume of freight transports. For trade, the volume of retail sales (at constant prices) was included. For agriculture, we compile our own index of production sold based on the procurement of main agricultural products: cereal grains, slaughter animals, and cow milk (another version also includes the procurement of potatoes).

Unlike the diffusion index applied in the U.S., which is composed of different economic variables reflecting various aspects of economic activity, our indicator is deemed to represent the aggregate level of real economic activity in the sense similar to that adopted in national accounts. Therefore it is directly comparable with GDP data.

An alternative solution widely used is to apply the monthly industrial production index. This is however not a good proxy for GDP since it usually represents no more than 30% of the total output and it often displays specific cycles. Our indicator has the advantage of a much wider coverage.

At the very beginning of our work on composite business indicators for Poland, we developed and tested several versions of GCI differing more or less in coverage and in some technical details. The version used here is deemed to be the best. It has been coded as GCI2D and it is represented in our database by the variable ZM091. For the period 1975-1982 it covered industry, construction, agriculture and transport, and since 1983 it also includes retail trade.

In order to identify cyclical changes in the economy over time, the GCI time series have been decomposed into four components: (a) seasonal fluctuation, (b) irregular (random) movements, (c) cyclical change, (d) trend. The split into (a), (b) and (c) + (d) was accomplished with help of X11-ARIMA, and the division between (c) and (d) with the OECD PAT procedure.

Sectoral indicators entering our GCI are transformed into volume indices 1992 = 100 and weighted by yearly shares of the respective sectors in gross domestic product (until 1989, in gross material product). The resulting aggregate index provides quite a good indication of month-by-month changes in total domestic output. For the years 1975-1989 it covered 80-85% of GMP; since 1990 it covers 60-70% of GDP. It may be thus viewed as a good proxy for GDP.

The GCI has been compiled since 1994 (once or twice a year) on a monthly basis for the period starting in January 1975. With the computer program developed in our project this index may be easily updated.

A similar indicator may be applied to any other country having monthly output or sales data for major sectors.

4. The concept of growth cycle and time series decomposition

Whereas the classical concept of 'business cycle' defined business cycles as sequence of expansions and contractions in general economic activity marked by changing levels of various macroeconomic variables, the newer concept of 'growth cycle' refers to the sequence of significant accelerations or decelerations of economic growth. It is more comprehensive because it covers both the traditional business cycles, including a period of an absolute fall in macroeconomic activity, and more discrete cycles with recession marked by a serious slowdown in economic growth. However, growth cycles are more difficult to interpret since the decrease of growth rates in late expansion often appears at high and still rising activity levels, and the increase of growth rates towards the end of recession does not yet mean that the economy began to grow. The difficulty involved in interpreting growth cycles is also related to the fact that most business cycle theories refer to the traditional concept of business cycle.[1]

[1] Typical relationships between different types and forms of economic cycles are widely elucidated in the literature. See: e.g. Ott, ed. (1973), Tichy (1976, 1994), Körber-Weik (1983), Klein and Moore (1985), Zarnowitz (1992), Niemira and Klein (1994), Maußner (1994). A new comprehensive review and analysis was recently given by Zarnowitz and Ozyildirim (2002). In the Polish literature see: Barczyk (1997b), Barczyk and Kowalczyk (1993), and Matkowski (1994, 1997a).

Nevertheless the concept of growth cycles, introduced by Ilse Mintz (1969, 1972) in her analysis of fluctuations in Germany and in the U.S., has come to the fore and it is now used in most empirical analyses of economic fluctuations worldwide.

Growth cycles may be analysed by growth rates of the reference index or its trend deviations (Tichy, 1976; Moore, 1983). Both methods give similar (though not exactly the same) results as regards the dating of turning points, but they represent quite a different approach to the concept of growth cycle. Therefore, they should be explicitly distinguished.

Both methods have some advantages and shortcomings. When analysing the growth rates, which are very volatile, we have to smooth them with a moving average. We must also adopt some arbitrary assumption about the minimum length of upward and downward phases. The last turning point can only be marked after the completion of the current phase. The assessment of current economic situation is hardly possible when looking only at growth rates. Trend deviations are more indicative of the actual state of the economy. They may be also reasonably interpreted in terms of deviations from potential output or equilibrium path. However, this method implies the necessity of detrending the time series, with all the doubts about the right form of trend. Moreover, it implies that trend and cycle are independent, an assumption which may be disputable.[2]

In this analysis we shall apply the concept of growth cycles measured by trend deviations. To isolate the cyclical component of our reference index we use X11-ARIMA deseasonalisation and smoothing procedure and the OECD PAT detrending method.

The X11-ARIMA is a well known seasonal adjustment procedure. It was developed in 1988 in the Statistics of Canada as an extension of the II/X11 method elaborated in the U.S. Bureau of Census (Dagum, 1988). There is also a new, updated version X12, but in our analysis we are still using the former version as to allow easy comparison with the earlier results.

The ARIMA procedure includes several steps aimed at an iterative smoothing of the original time series. It is based on the autoregressive-integrated-moving average model developed by Box and Jenkins (1976), which belongs to the class of ARMA models. The description of the model and of the filters used is given in the literature (Harvey, 1994; Hamilton, 1994).

The X11-ARIMA program fulfils three basic functions:

(a) time series decomposition into three components: irregular movements, seasonal changes, and trend-cycle;
(b) seasonal adjustment of time series;
(c) autoregressive 12 months forecast.

With help of an automatically chosen or a deliberately selected autoregressive model, the program decomposes the time series and eliminates seasonal changes. It

[2] On the economic relationship between trend and cycle see e.g. Kaldor (1954), Higgins (1955), and Kalecki (1968).

also alleviates or removes irregular movements and gives the MCD-smoothed time series which is considered the best for business cycle analysis.

The program yields: (a) seasonally adjusted time series, (b) MCD-smoothed time series, (c) trend-cycle (Henderson curve) estimated as a long-term moving average. Moreover, it gives a detailed analysis of the stochastic properties of time series, including quality control statistic (QCS), the final proof of the regularity of the series and its acceptability for econometric models.

The phase-average-trend method (PAT) is a detrending procedure based on the method originally proposed by Bry and Boschan (1971).[3] It aims to indicate the turning points of cycles and their amplitudes on the basis of trend-deviations. It assumes a variable trend, represented by a broken line, smoothed at each coupling. The trend is established by an iterative procedure using moving averages of different length, beginning from very long and coming down to very short periods.

The final stage of the PAT procedure eliminates doubtful turning points at both ends, phases shorter than 5 months, and cycles shorter than 15 months. Some of these criteria can be too restrictive for a transition economy which may develop less regularly due to market imperfections and its vulnerability to internal and external shocks.

The automatic PAT procedure often fails to reconstruct properly actual cyclical developments. In such a case, it should be augmented by preliminary input data on turning points, based on the analysis of graphs obtained from X11-ARIMA.

For all the practical purposes, PAT may only be applied to long time series. With short time series (up to 10 years) there is usually no reason to apply variable trends, and in most cases we can simply rely on linear regression. Of course, if necessary, Hodrick-Prescott (HP) filter may also be used.

5. Empirical results

In this analysis our reference index was calculated at monthly intervals for the period 1975-2002.

Table 1. Statistical properties of GCI

QCS	MCD	Relative contribution to stationary variance			Average duration of run			*F*-test for seasonality		ARIMA forecast 1 year		
		I	S	TC	I	TC	MCD	stable	moving	R^2	χ^2	S.E.
0.49	5	2.0	10.1	87.5	1.5	8.6	3.3	59.1*	1.5	0.96	0.85	4.1

* Seasonality present at the 0.1% level.

I – irregular, S – seasonal, TC – trend-cycle. QCS – quality control statistic (required QCS ≤ 1), MCD – months for cyclical dominance (required MCD ≤ 6).

Statistical properties of the GCI time series as disclosed by X11-ARIMA procedure are shown in Table 1. With QCS = 0.49 and MCD = 5, the indicator is acceptable for business cycle research. The amount of irregular movement is negligible. Seasonal changes, not

[3] See also Boschan, Ebanks (1978), Nilsson (1991), and OECD (1995).

very much pronounced, can be easily eliminated thanks to their stable patterns. The estimated ARIMA model renders quite a good autoregressive 12-month backward forecast with $R^2 = 0.96$ and S.E. = 4.1.

The same procedure brings an autoregressive forecast of the analysed time series. However, we should be very cautious about such extrapolative forecasts, especially around the turning points. This is evidenced by Figure 1, which shows the forecast of our GCI rendered by ARIMA. While the backward forecast for 2002 was quite good, the forward forecast for 2003 turns out to be false. This is because the procedure simply extrapolates the stagnation of our indicator during 2000-02 while in fact there was meanwhile some revival in the economy as evidenced by statistical data.

Figure 1. Autoregressive 12 month forecast of GCI

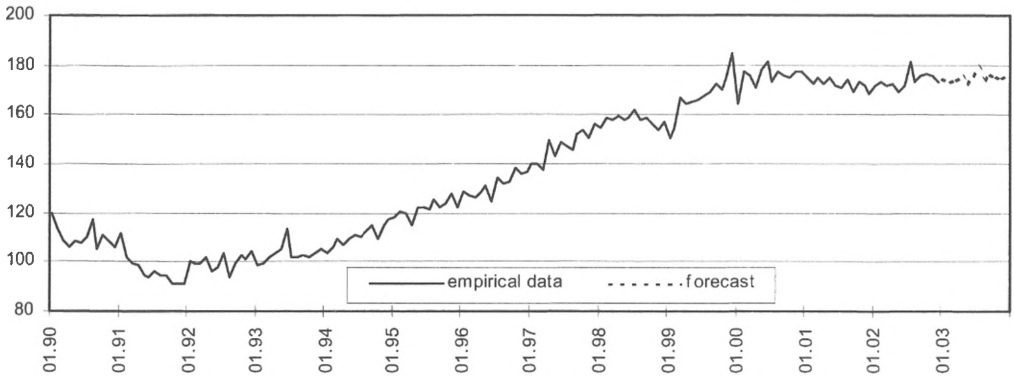


Figure 2 shows the behaviour of the GCI over time. The index is presented in the form of rough data, trend-cycle (13-term Henderson curve), and cyclical component as represented by seasonally adjusted, MCD-smoothed and detrended time series. We can see the two well fledged long business cycles, a minor cycle provoked by the Russian crisis, and the recent slowdown marking a beginning of a new cycle.

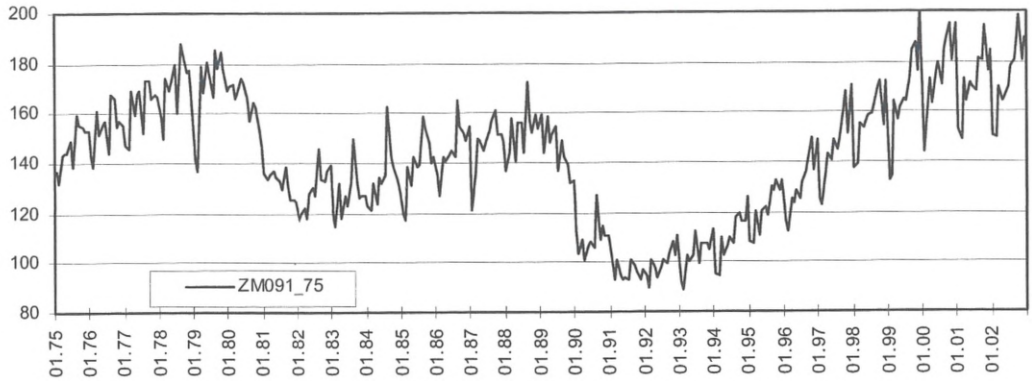
Figure 3 illustrates the difference in the cyclical component of GCI depending on the detrending method. Noteworthy is the difference between the results of the automatic and controlled PAT procedures.

There is a significant difference in the picture of cyclical developments as indicated by the automatic PAT procedure and the controlled PAT option, assisted by preliminary input data on major turning points marked upon examination of the seasonally adjusted and MCD-smoothed time series rendered by X11-ARIMA. The automatic PAT version identifies basically the same major cycles, but it also shows some auxiliary minor cycles. The controlled PAT version option ignores minor short-term fluctuations, focusing on more pronounced cycles.

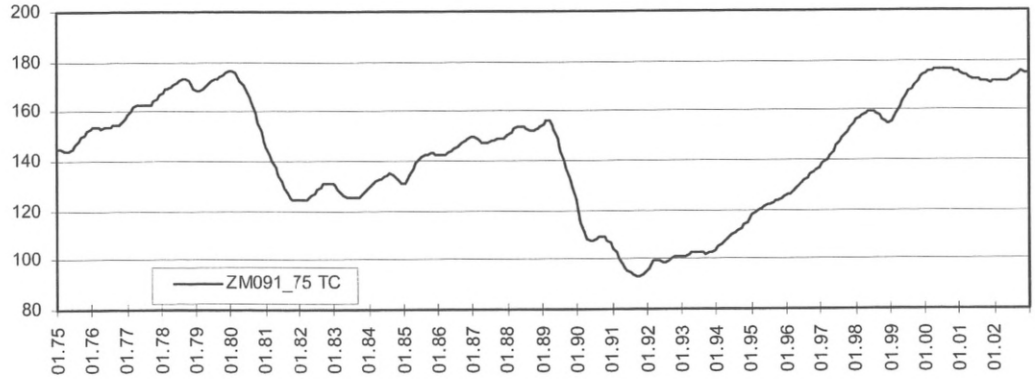
Our experience with the PAT detrending method on many macroeconomic time series suggests that built-in (automatic) PAT procedure fails to indicate properly major swings in the economy, by reporting too many minor fluctuations and splitting thereby

Figure 2. General coincident indicator for Poland: 1975-2002

Rough data



Trend-cycle



Cyclical component

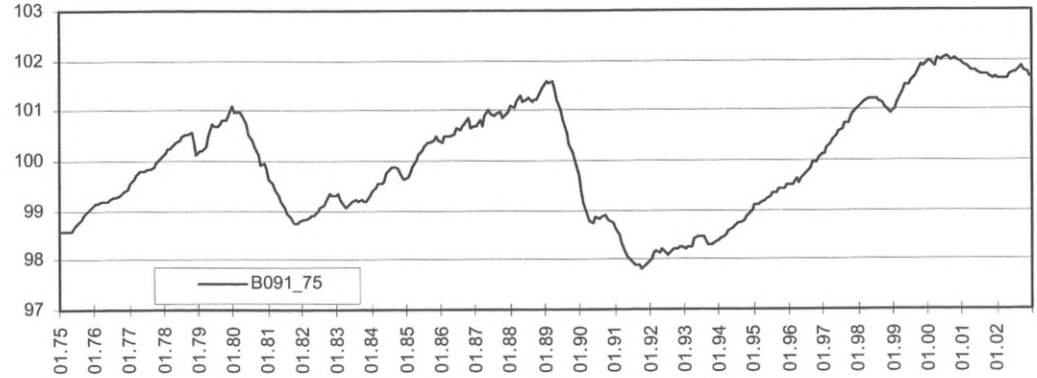
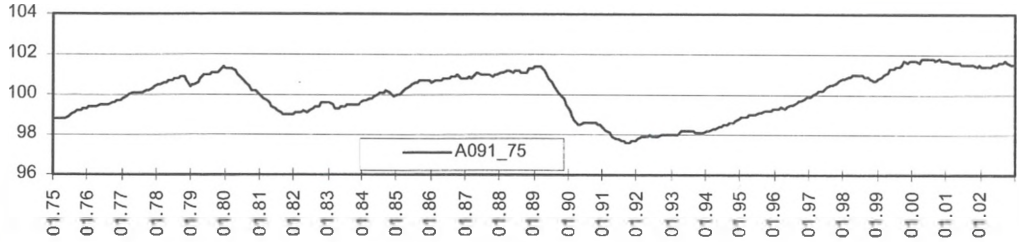
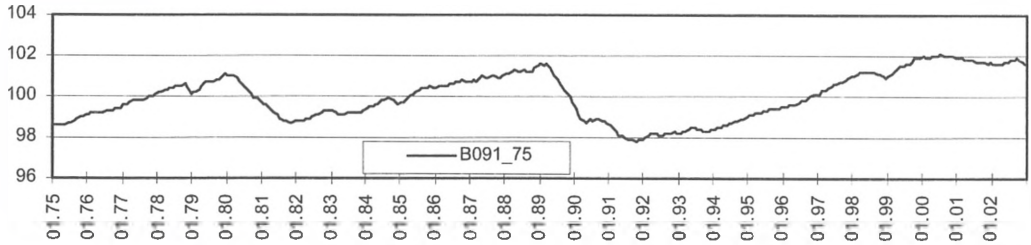


Figure 3. Cyclical component of GCI

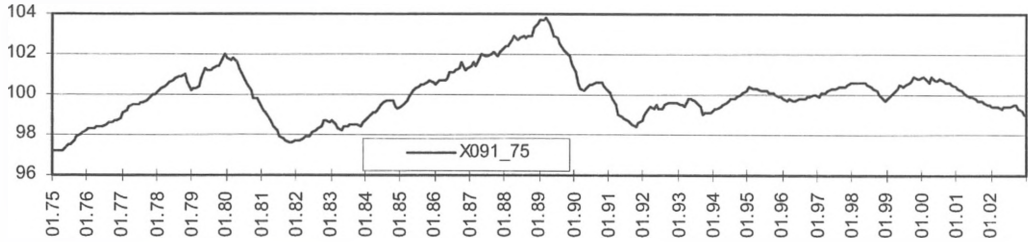
A091 – controlled PAT



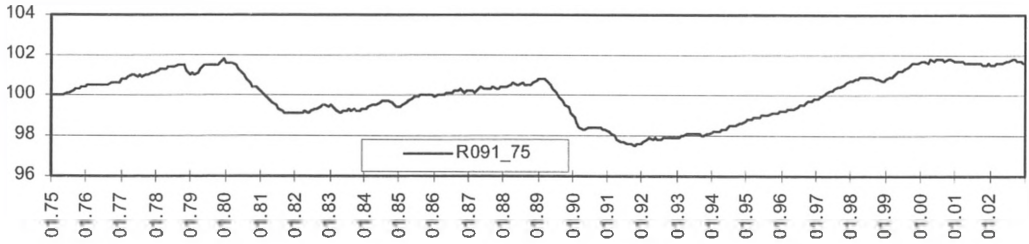
B091 – controlled PAT



X091 – automatic PAT



R091 – linear regression



longer cycles. In this analysis we wish to concentrate on major cycles. Therefore, we shall rely on the results rendered by the controlled PAT version.

The cyclical component of our reference indicator allowed us to reconstruct cyclical development of the Polish economy over the analysed period. The chronology and amplitudes of cycles are shown in Table 2. All the data refer to the PAT detrending variant B091 adopted in this analysis.

Table 2. Turning points and the amplitude of growth cycles

Turning points		Phase length (months)	Amplitude (percent)	
Peak	Trough		Change	Trend deviation (R/T)
P12.79				
	T10.81	22	-30.2	-26.9
P03.89		89	+26.8	+46.7
	T10.91	31	-41.8	-40.9
P04.00		102	+81.6	+55.4
	T11.01	19	-4.4	-5.0

In the period under consideration we see two very well fledged economic cycles, with deep recessions of 1980-81 and 1989-91, and a slowdown in 2000-01. The first recession of 1980-81 was the result of the collapse of the former political and economic system as evidenced by rising political chaos, social turmoil and strikes, up to the establishment of the martial law in late 1981. The recession lasted 22 months and it led to a deep fall in total output: in terms of our GCI by 30%. The second recession of 1989-91 was caused by the transformation crisis, reorientation of external links and a shock anti-inflationary therapy. It lasted 31 months and was marked by the fall of our GCI by 42%.

The two recessions were strongly influenced by political factors and by the change in economic system. They combined the features typical of cyclical downturns and structural crises. Despite the unique and complex nature of their causes, both recessions launched adjustment processes quite similar to those seen in business cycles. This fact can justify the use of analytical tools developed in the framework of business cycle research.

The depth of both recessions as measured by our GCI was roughly twice as great as the amplitude suggested by the official GDP data. This discrepancy is partly due to the fact that GDP was calculated on a yearly basis whereas our GCI is a monthly index. Another cause is insufficient coverage of the service sector in our reference indicator, a factor that makes it more vulnerable to cyclical movement. Anyway, our GCI appears to be a very sensitive indicator of cyclical changes in the economy.

Towards the end of the period, there is a new peak in early 2000, followed by a slowdown of 2000-01, and a new trough in late 2001 announcing a revival. However, the latter turning points are preliminary and may be revised at the next updating.[4]

Altogether, in the period 1975-2002 we can see two very well pronounced long cycles, with the average duration of 10 years between the peaks or troughs. Noteworthy is the fact

[4] Turning points established in this analysis at the end of period differ from those indicated in our parallel paper on the ESIs included in this book because of different detrending methods and different reference indicators.

that the recent slowdown appeared exactly after the same time span as the former recessions. What is most interesting, the two cycles have exactly the same average length as measured between the peaks and between the troughs (122 and 121 months respectively).

Another minor cycle, indicated by the automatic PAT procedure, is marked by the peak in early 1998 and a trough in the late 1998, followed by a new peak in late 1999. This mini-cycle, largely related to the Russian crisis, covered about 2 years.

Looking back at the growth pattern of the Polish economy before the period covered by this analysis, there was a peak of the GMP growth rate in 1973, six years before the 1980-81 recession. Even if the data are not fully comparable, it is evident that growth cycles in Poland were already seen at times of the so-called centrally planned economy. Perhaps, in spite of all the differences between the former and the current economic system, there is some intrinsic rhythm in the development of the economy over time, which comes to the fore quite independent of political shocks and systemic changes. However, in order to verify this hypothesis we would need a longer time of observation.

These estimates have been supported by the results of the spectral analysis of GCI series (Łuczyński and Matkowski, 2004) which suggested the occurrence of major cycles lasting 9-10 years and minor cycles covering 2-4 years.

The above findings about the length of economic cycles in Poland are more or less comparable with the long-run pattern of business cycles in the developed market economies. In the historical record of business cycles in the U.S. and other developed countries two kinds of business cycles are usually distinguished: minor cycles of the average length of 3.5 years, and major cycles of the average length of 8.5 years. In economic theory, the first are often referred to as Kitchin cycles and attributed to the change of stocks. The second ones are called Juglar cycles and related to the fluctuation of fixed investment.[5] Growth cycles marked by the fluctuation of growth rates are typically shorter, ranging between 2 and 7 years.

With the progress of transformation towards an open market economy and the advancement of economic integration with EU, the pattern of fluctuations in Poland's economic development may change. Apart from major long cycles there may be more minor cycles, marked by successive acceleration and deceleration of economic growth, induced by internal mechanism of economic growth and external impulses.

6. Cyclical changes in major sectors

One of the most exciting and least elucidated questions in business cycles is the synchronisation of cyclical fluctuation among the major sectors of national economy. Are the growth cycles observed in the aggregate economic activity actually diffused? Which sectors are most affected by recessions? Which sectors are the driving force of cyclical movement in the economy and which of them tend to alleviate the overall size of fluctuation? What is the pattern of specific cycles displayed by individual sectors of economy? In this paper we can only briefly address these important questions.

[5] See: Burns and Mitchell (1946), Estey (1956).

Table 3 presents statistical characteristics of the time series entering our aggregate GCI index. The time series are regular enough in terms of QCS and MCD to be used in a cyclical analysis. Their dynamics is dominated by trend and cycle (TC). The amount of irregular changes (I) is quite low. The relative amount of seasonal movement (S) differs being inversely related to the size of trend and cycle. Industry and transport are not much affected by seasonal movement, but construction and agriculture are heavily influenced by seasonal changes. Significant seasonality is nevertheless present in all the sectors.

Table 3. Statistical properties of economic indicators by sector

Sector	QCS	MCD	Relative contribution to stationary variance			*F*-test for seasonality		Average duration of run			ARIMA forecast
			I	S	C	stable	moving	I	C	MCD	
Industry	0.70	5	3.2	5.8	89.2	27.3*	1.5	1.5	10.5	3.3	yes
Construction	0.58	5	3.1	28.0	68.6	49.5*	6.4**	1.7	8.2	4.4	yes
Agriculture	0.57	6	5.4	34.2	58.8	91.3*	2.0**	1.6	7.0	4.3	yes
Transport	0.38	4	1.7	9.9	87.8	83.0*	1.0	1.5	7.8	4.5	yes
Trade	0.46	4	4.2	19.5	71.6	55.6*	0.6	1.5	9.6	4.7	yes
Total (GCI)	0.49	5	2.0	10.1	87.5	59.1*	1.5	1.5	8.6	3.3	yes

* Seasonality present at 0.1% level. ** Seasonality present at 1% level. Other notations as in Table 1.

The correspondence between the cyclical developments in individual sectors and the economy as a whole can be assessed by the results of cross correlation between the indicators representing the activity levels in individual sectors and our aggregate indicator GCI. Cross-correlation was performed on the detrended, seasonally adjusted and MCD-smoothed time series representing pure cyclical components. High correlation observed at minor leads or lags would suggest that the given sector developed in accord with the reference cycle while low correlation with long leads or lags would indicate that the sector in question was not much suspectible to macroeconomic developments and/or it displayed specific cycles unrelated to the general condition of economy. The maximum correlation coefficients against the reference index in this test were as follows (with leads or lags given in brackets): industry 0.980 (0), construction 0.820 (-7), agriculture 0.767 (+8), transport 0.890 (+1), trade 0.746 (+2).

The results of cross-correlation suggest that industry and transport are well correlated with the reference cycle while agriculture and trade are less dependent on the course of aggregate economic activity. Industry, transport and trade seem to move almost coincidently with the change of overall economic activity. Construction tends to lead cyclical swings in the whole economy by about two quarters while agriculture typically lags behind by about three quarters. The correlograms for agriculture are however quite flat, with fuzzy peaks indicating variable lags.

The chronology of cycles observed in individual sectors, as well as their amplitudes, obviously depend on the methods used to identify the trend. The controlled PAT procedure (with preliminary input) helps us to concentrate on major cycles. This procedure has been used to establish the chronology presented in Table 4.

Table 4. Chronology of growth cycles

Sector	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Industry					P12 79			T02 82	P01 83 T09 83					P04 88
Construction					T03 79 P12 79			T07 82						
Agriculture	T06 75	P01 76 T12 76		P10 78			T09 81							
Transport						P03 80		T01 82						
Retail trade[a]														
Economy					P12 79		T10 81							

Sector	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Industry			T10 91							P05 98 T12 98		P07 00		T03 02
Construction	P01 89	T10 90			P07 93	T01 94				P06 98				
Agriculture	P02 89					T01 94								
Transport	P02 89			T06 92								P12 00	T08 01	
Retail trade[a]	P03 89	T03 90	P02 91			T11 94	P11 95	T07 96			P10 99		T03 01	
Economy	P03 89		T10 91									P04 00	T11 01	

[a] Data for retail trade are available since 1983.

The correspondence between the cyclical developments in individual sectors and the economy as a whole is also illustrated by Figure 4. It shows the cyclical component of the activity level in the respective sector (dashed line) against the cyclical component of the reference cycle, reflecting the development of the whole economy (solid line). The graphs show the synchronisation of cyclical movements in different sectors with reference indicator, but they do not show the difference in amplitudes (all time series are amplitude-adjusted).

Industry, construction and transport have been moving more or less in line with the aggregate economic activity, responding keenly to both recessions. Apart from the overall economic cycles, industry and construction revealed 1–2 extra specific cycles. Agriculture was strongly hit by both recessions, but it followed besides its own development rhythm. The deep and prolonged fall in agricultural production between 1989 and 1993 was the result of a structural crisis which has not yet been fully overcome. In spite of many problems facing the Polish agriculture nowadays, since 1994 agricultural output has been nevertheless increasing. Retail trade, with the data available since 1983 only, displays minor trade cycles which distort correlation with the reference cycle.

Table 5 compares the length and depth of recessions in individual sectors. Column (A) shows the change in output between the peak and trough of the reference cycle, and column (B) shows the change between the start and the end of the respective recession within the sector.

Table 5. The recessions in major sectors

Sector	Recession 1980-81			Recession 1989-91			Recession 2000-01		
	Length (months)	Change (%) A	Change (%) B	Length (months)	Change (%) A	Change (%) B	Length (months)	Change (%) A	Change (%) B
Industry	26	-22.4	-26.9	42	-41.6	-41.9	20	-0.7	-1.9
Construction	31	-35.2	-38.6	21	-32.1	-40.4	54	-16.7	-19.1[b]
Agriculture	35	-31.4	-34.9	59	-41.0	-60.9	–	+8.7	–
Transport	22	-37.1	-42.1	40	-61.6	-65.2	8	-12.8	-9.3
Retail trade[a]	.	.	.	12	-23.2	-28.2	17	0.0	-4.2
Economy	22	-30.2	–	31	-41.8	–	19	-4.4	–

A – change from peak to trough of the reference cycle. B – change from peak to trough of the sectoral cycle.
[a] Data for retail trade are only available since 1983.
[b] Till the end of period.

In the first recession of 1980-81, industry was relatively less affected than the other sectors, both as regards the length and depth of fall. For trade we have no volume data for that period, but the slack was probably quite deep due to the dramatic scarcity of goods in the market during that time.

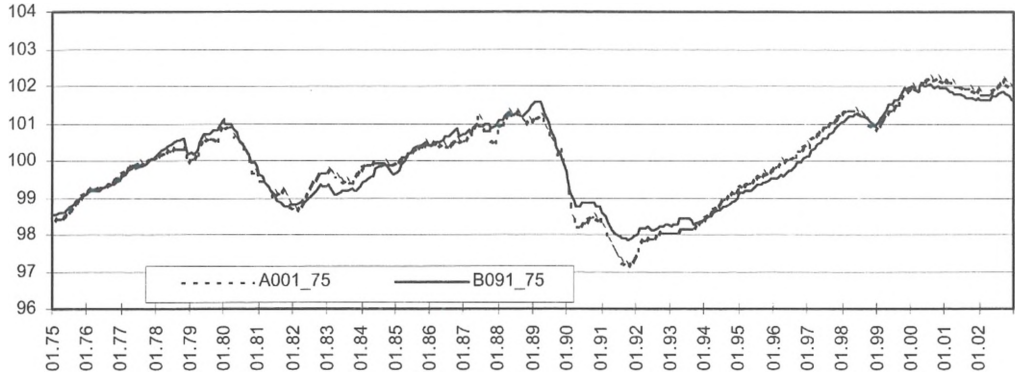
Agriculture and transport were most severely hit by the crisis of 1989-91. Industry and construction suffered a drop comparable to the fall in total output. Retail trade noted a smaller fall and it began to recover much earlier. As a matter of fact, trade and construction, along with the service sector, were the first to start the recovery.

During the slowdown of 2000-01, the decrease in construction and transports and the stagnation in industry and trade were the major factors behind the slowdown.

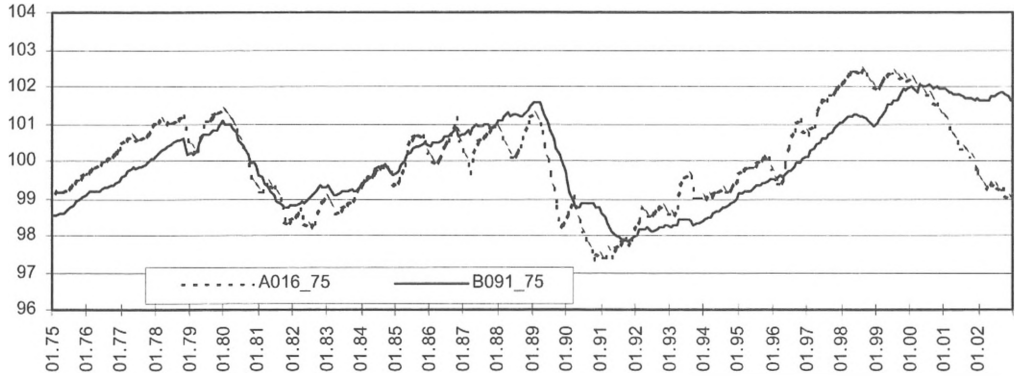
In order to analyse the behaviour of individual sectors during overall growth cycles we should also consider leads or lags.

Figure 4. Fluctuation in major sectors against reference cycle

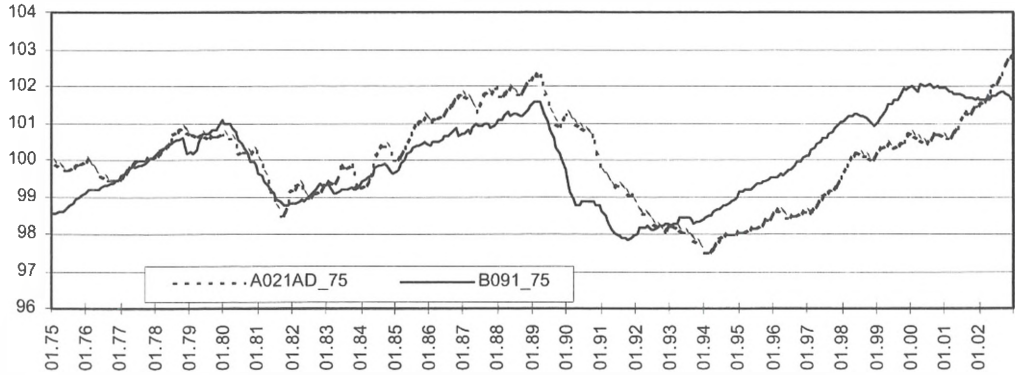
Industry



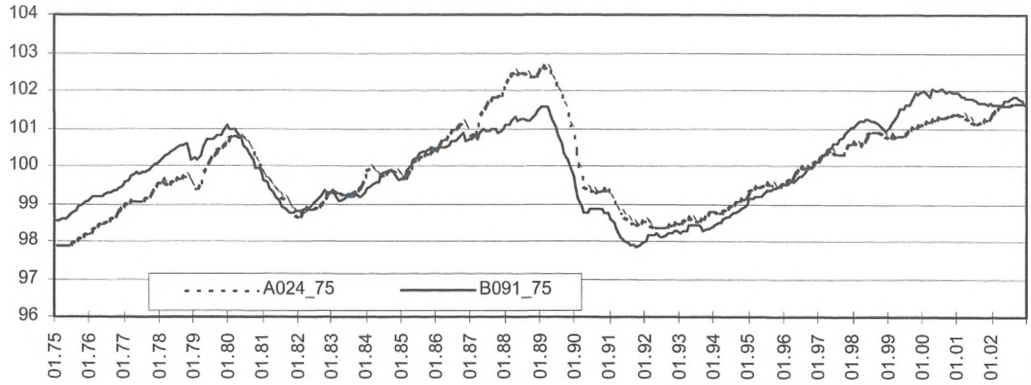
Construction



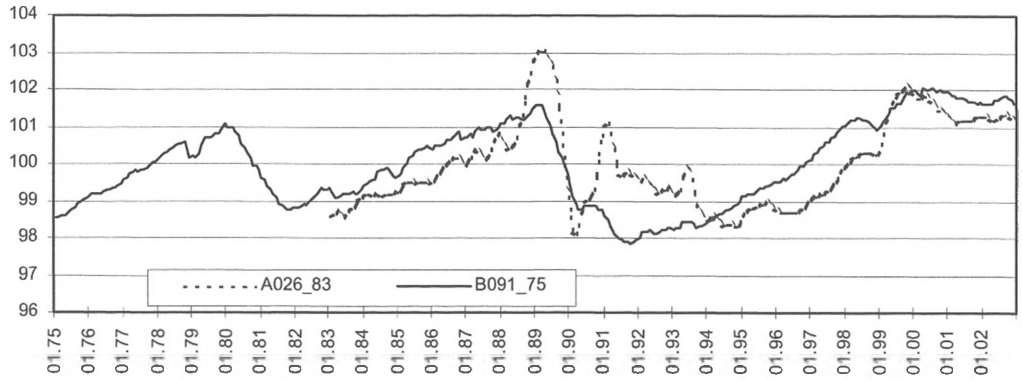
Agriculture



Transport



Trade



In the recession of 1980-81 agriculture was the first sector to fall. In the recession of 1989-91 agriculture in turn continued to decrease or stagnate much longer than any other sector while construction and trade went out of recession significantly earlier. The recent slowdown was announced by a decline in industry, construction and trade while agriculture continued to develop since 1994.

Summing up, no typical pattern can be observed as to the sequence of peaks and troughs in major economic sectors and their role in aggravating or alleviating cyclical fluctuations in the economy. Perhaps, the period covered by this analysis is still too short to discover any regularity. However, one significant observation can already be made. Namely, industry and trade were certainly not the prime engines of growth cycles in the economy as suggested by most theories.

Despite some ambivalence about the typical growth patterns of individual sectors and their role in the cyclical changes in the economy, the research on the subject should be continued. It may significantly supplement the analysis of the main components of final demand to give a more comprehensive picture and explanation of economic cycles. At the same time, empirical research on the morphology of economic

cycles should be extended in order to explain the mechanisms of the fluctuation with consideration given to both internal and external factors.

7. Conclusions

1. This paper presents the results of the analysis of growth cycles seen in the development of the Polish economy in the period 1975-2002. Cyclical developments in the economy have been analysed using our own reference index GCI, which is a monthly proxy to GDP based on output or sales data from five major sectors of the economy: industry, construction, agriculture, transport, and trade. Growth cycles were identified using the cyclical component of our reference indicator, isolated by the X11-ARIMA and OECD PAT procedures.
2. In the period covered by the analysis, we see two very pronounced long-term cycles lasting about 10 years, and the beginning of a new cycle. Though the two major recessions of 1979-81 and 1989-91 were strongly affected by the unique political and structural factors, related to the collapse of the former economic system and the establishment of a new one, the adaptation processes launched by both recessions were quite similar to those seen in market economies during business cycles. With the progress of transformation towards an open market economy these fluctuations may turn into more or less regular business vs. growth cycles. Apart from major cycles, marked by absolute declines, there would be probably more minor growth cycles induced by internal growth mechanism and international cooperation.
3. The results of our analysis of cyclical developments in major sectors of the economy are not very conclusive due to the shortness of the observation. Nevertheless, one significant conclusion can already be made. Industry and trade, contrary to the assumptions made in business cycle theory, have not been the prime drivers of growth cycles seen in the development of the Polish economy over time.
4. The research on the subject should be continued as to discover and explain the cyclical patterns seen in the transition economy after systemic transformation and economic integration with European Union. The focus on the morphology of economic cycles should be supplemented by the attempts to explain the mechanism of growth cycles with consideration given to both internal and external factors.

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